appendix C

Summary of Literature on the Tolerance of Chesapeake Bay Macrobenthic Species to Low Dissolved Oxygen Conditions

Species	Life Stage	Dissolved Oxygen (mg liter^{-1})	Temp (°C)	Observed Response	Reference
Mollusca					
Abra alba	Adult	0	10	LD_{50} in 200 hrs	Dries and Theede 1974
Cardium edule	Adult	0	10	50% mortality in 7 days	Thamdrup 1935 referenced in O'Connor (unpublished manuscript)
	Adult	0.15	10	50% mortality in 102 hrs (4.3 days) without sulfide, 96 hrs (4 days) with sulfide (50 mg liter^{-1} $Na_2S.9H_2O$	Theede et al. 1969; Theede 1973
Carium lamarki	Adult	0	10	LD_{50} in - 220 hrs (9.2 days)	Dries and Theede 1974
Littorina littoria	Adult	0.15	10	LD_{50} in 365 hrs (15.2 days) without sulfide, 180 hrs (7.5 days) with sulfide; 50 mg liter^{-1}	Theede et al. 1969; Theede 1973
Littorina saxatilus	Adult	0.15	10	LD_{50} in 365 hrs (15.2 days) without sulfide, 72 hrs (3 days) with sulfide; 50 mg liter^{-1}	Theede et al. 1969; Theede 1973
Macoma balthica	Adult	0	10	4% mortality in 7 days	Thamdrup 1935; referenced in O'Conner (unpublished manuscript)
	Adult	0	10	LD_{50} in 500 hrs (20.8 days)	Dries and Theede 1974
Mercenaria mercenaria	Larvae	0.9-2.4	25	Reduced growth	Morrison 1971
		0.2	25	100% mortality in 14 days	Morrison 1971
	NR	0.9	25	0% mortality in 14 days	Morrison 1971

Species	Life Stage	Dissolved Oxygen (mg liter^{-1})	Temp (°C)	Observed Response	Reference
	Juvenile/ Adult (31-38 mm)	5.7	19-24	Maximum burrowing rate	Savage 1976
	NR	0.9-1.8	17-24	Reduced burrowing rate	Savage 1976
	NR	0.9	19	No mortality in 21 days and 30 days (two trials)	Savage 1976
Mulina lateralis	Juvenile (5 mm)	0	10	LT_{50} in 10.5 days without sulfide, 4.3 days with sulfide; 644 mg liter^{-1} $Na_2S.9H_2O$	Shumway and Scott 1983; referenced in O'Conner (unpublished manuscript)
	NR	0	20	LT_{50} in 7.5 days	Shumway and Scott 1983; referenced in O'Conner (unpublished manuscript)
Mulina lateralis	NR	0	30	LT_{50} in 2 days	Shumway and Scott 1983; referenced in O'Conner (unpublished manuscript)
	Adult (10 mm)	0	10	LT_{50} in 10 days without sulfide, 3.8 days with sulfide; 644 mg liter^{-1} $Na_2S.9H_2O$	Shumway and Scott 1983; referenced in O'Conner (unpublished manuscript)
	NR	0	20	LT_{50} in 2.5 days	Shumway and Scott 1983; referenced in O'Conner (unpublished manuscript)
	NR	0	30	LT_{50} in 1.8 days	Shumway and Scott 1983; referenced in O'conner (unpublished manuscript)
Mya arenaria	NR	0	'very low'	Survived for 'weeks'	Collip 1921; referenced in O'Conner (unpublished manuscript)
	NR	0	14	Survived 8 days	Collip 1921; referenced in O'Conner (unpublished manuscript)
	NR	0	31	Survived 1 day	Collip 1921; referenced in O'Conner (unpublished manuscript)

Species	Life Stage	Dissolved Oxygen (mg liter^{-1})	Temp (°C)	Observed Response	Reference
Mya arenaria	Adult	0.2	10	LC_{50} in 21 days without sulfide, 17 days with sulfide.	Theede et al. 1969; Theede 1973; referenced in O'Conner (unpublished manuscript)
Mytilus edulis	Adult	0.2	10	LC_{50} in 35 days without sulfide, 25 days with sulfide	Theede et al. 1969; Theede 1973; referenced in O'Conner (unpublished manuscript)
	Adult	0	10	20% mortality in 7 days	Thamdrup 1935; referenced in O'Conner (unpublished manuscript)
Spisula solidissima	Adult (49-64 mm)	5.3-6.0	11-22	Maximum burrowing rate	Savage 1976
	NR	0.8-1.6	11-22	Reduced burrowing rate, mortality	Savage 1976
	NR	1.6	21.7	1 of 9 dead in 5 days	Savage 1976
	NR	0.9	21.0	3 of 9 dead in 5 days	Savage 1976
	Juvenile/ Adult (31-28mm)	5.7	19-24	Maximum burrowing rate	Savage 1976
	NR	0.9-1.8	17-24	Reduced burrowing rate	Savage 1976
Spisula solidissima	NR	0.9	19	No mortality in 21 days and 30 days (two trials)	Savage 1976
Mulinia lateralis	Juvenile (5 mm)	0	10	LT_{50} in 10.5 days without sulfide, 4.3 with sulfide; 644 mg liter^{-1} $Na_2S.9H_2O$	Shumway and Scott 1983; referenced in O'Conner (unpublished manuscript)
	NR	0	20	LT_{50} in 7.5 days	Shumway and Scott 1983; referenced in O'Conner (unpublished manuscript)
	NR	0	30	LT_{50} in 2 days	Shumway and Scott 1983; referenced in O'Conner (unpublished manuscript)

Species	Life Stage	Dissolved Oxygen (mg liter^{-1})	Temp (°C)	Observed Response	Reference
	Adult (10 mm)	0	10	LT_{50} in 10 days without sulfide, 3.8 days with sulfide; 644 mg liter^{-1} $Na_2S.9H_2O$	Shumway and Scott 1983; referenced in O'Conner (unpublished manuscript)
	NR	0	20	LT_{50} in 2.5 days	Shumway and Scott 1983; referenced in O'Conner (unpublished manuscript)
	NR	0	30	LT_{50} in 1.8 days	Shumway and Scott 1983; referenced in O'Conner (unpublished manuscript)
	Adult (100 mm)	1.0	10	LC_{50} in 15 days; initial mortality in 8 days; total mortality in 30 days	Thurberg and Goodlett 1979
Mulinia lateralis	NR	3.0	10	No mortality in 2 months	Thurberg and Goodlett 1979
	Juvenile/ Adult (3.7-5 cm)	1.0	10	LC_{50} in 7 days	Thurberg and Goodlett 1979
	Juvenile/ Adult (3.8-4.6 cm)	2.0	10	LC_{50} in 21 days	Thurberg and Goodlett 1979
Polychaeta					
Capitella capitata	Adult	0	12	Mortality in 8 days	Jacubowa and Malm 1931; referenced in O'Conner (unpublished manuscript)
Capitomastus minimus	Adult	0	12	Mortality in 8 days	Jacubowa and Malm 1931; referenced in O'Conner (unpublished manuscript)
Etoeone picta	Adult	0	12	Mortality in 6 days	Jacubowa and Malm 1931; referenced in O'Conner (unpublished manuscript)
Glycera convoluta	Adult	0	12	Mortality in 10 days	Jacubowa and Malm 1931; referenced in O'Conner (unpublished manuscript)

Species	Life Stage	Dissolved Oxygen (mg liter^{-1})	Temp (°C)	Observed Response	Reference
Harmothae incerta	Adult	0	12	Mortality in 5 days	Jacubowa and Malm 1931; referenced in O'Conner (unpublished manuscript)
Nephtys ciliata	Adult	0	10	LD_{50} in 140 hr (5.8 days)	Dries and Theede 1974
Nerevis diversicolor	Adult	0.2	10	LC_{50} in 5 days without sulfide, 4 days with sulfide; referenced in O'Conner (unpublished manuscript)	Theede et al. 1969; Theede 1973
	Adult	0	10	LD_{50} in 120 hrs (5 days)	Dries and Theede 1974
	Adult	0	6-8	72 hrs with no mortality; ATP conc. 59% of initial value (after 72 hrs)	Schottler 1979
Nereis pelagica	Adult	0	6-8	40% mortality after 36 hrs; ATP conc. 51% of initial value (after 72 hrs)	Schottler 1979
Nereis virens	Adult	0	6-8	72 hrs with no mortality; ATP conc. 57% of initial value (after 72 hrs)	Schottler 1979
Pectinaria neapolitana	Adult	0	12	Mortality in 8 days	Jacubowa and Malm 1931; referenced in O'Conner (unpublished manuscript)
Terebellides stroemi	Adult	0	10	LD_{50} in 72 hrs (3 days)	Dries and Theede 1974

Source: Holland et al. 1989.

NR = not reported.
LC_{50} = lethal concentration at which 50 percent mortality of the test organisms was observed.
LD_{50} = lethal dose (same as LC_{50}).
LT_{50} = lethal threshold (same as LC_{50}).

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